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October 7, 2021

Ms. Jennifer Ferrigan
Geologist – Permit Coordinator
Oil, Gas, and Minerals Division
Michigan Department of Environment, Great Lakes and Energy
525 West Allegan Street
PO Box 30256
Lansing, MI 48909

RE: Republic Services Carleton Farms Landfill Part 625 Mineral Well Permit Application

VIA FEDEX

Dear Ms. Ferrigan:

Enclosed please find the updated Waste Analysis Plan revised to include modified sampling frequencies as required by the U.S. EPA. This submission replaces the Waste Analysis Plan included in Attachment C of the Part 625 Mineral Well Permit Application dated June, 2021.

Please feel free to contact me at 303-290-9414, ext. 417, or Mr. Bobby (James) Reese at 734-635-8988 with any questions.

Sincerely,

Petrotek Corporation
Connie Walker- Geologist

cc: Steve Smith – Republic Services
Bobby Reese – Carleton Farms Landfill
Christina Pearce – Carleton Farms Landfill
Ken Cooper, Aaron Payne – Petrotek

UIC WASTE ANALYSIS PLAN
Class I Deepwell

for
Carleton Farms Landfill
Republic Services of Michigan I, LLC

Class I Deepwells
Michigan 625 Mineral Well and EPA Permit #s TBD

New Boston, Michigan

June, 2021
Updated October, 2021

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1.0 INTRODUCTION

1.A Background

The purpose of this Waste Analysis Plan (WAP) is to characterize the non-hazardous landfill leachate waste water to be injected into the Republic Services Michigan I, LLC injection wells to be located at the Carleton Farms Landfill (CFL) in Wayne County, Michigan. CFL will be responsible for implementing this WAP. The injection wells are projected to be constructed in 2020. Waste will be injected into the Mt. Simon Formation through Franconia Formations at a projected top depth of approximately 3,200 feet below ground surface.

CFL intends to operate the wells consistent with Title 40 of the Code of Federal Regulations (40 CFR), Section 146.13 that requires operators of Class I underground injection wells to monitor and analyze the fluids injected into the well "to yield representative data of their characteristics." This waste analysis plan also fulfills the specifications at 40 CFR 146.68 by presenting parameters for which the waste will be analyzed, methods that will be used to test for these parameters, and methods that will be used to obtain representative samples of the waste to be analyzed. This waste analysis plan also satisfies the requirements of Rule 299.2415(13), Operation of Disposal wells; Monitoring and Reporting Requirements.

1.B Sources

The CFL generates non-hazardous leachate. There is no SIC code for sanitary landfill leachate. The SIC code for sanitary landfills is 562212.

The waste waters produced at the landfill include water collected from leachate collection system, which originates from water infiltration through waste, as well as condensate from the gas collection system. Some groundwater or run-off may also be collected on-site and added to this leachate if necessary. Fluids generated during well maintenance or testing activities may also be reinjected into the well. The waste stream is primarily composed of inorganic, non-hazardous compounds such as chloride, and potassium, with a historic TDS of up to approximately 14,000 ppm.

Waste water is first accumulated in each landfill cell, then piped to leachate collection tanks. Although some settling may occur and CFL may elect to filter waste water prior to injection in the future, no waste treatment for regulatory purposes is performed in the tanks.

1.C Summary

The major components of the CFLs waste characterization and UIC monitoring program include:

- Volume Monitoring
- Sampling and Analysis
- Quality Assurance/Quality Control

These components are addressed in Sections 2 and 3, below.

The WAP may be reviewed and, if necessary, revised if conditions are identified that may significantly alter the chemical or physical properties of the waste. Revisions to the WAP may also be required if new permit conditions are added by the Agency for cause. Any future revisions to the WAP, upon approval, will become part of the administrative record and constitute a minor modification of the permit. Compatibility issues regarding the subsurface rock matrix and well construction materials are documented in the permit application and are not addressed in this WAP.

2.0 PROCEDURES

2.A Volume Monitoring

As discussed in the text of the Permit Application, flow and pressure recorders are to be used to continuously monitor injection pressure, annulus pressure, and flow rate; totalized cumulative volumes for the wells will be calculated from monitoring data. A summary of recorded data will be provided to the US EPA per applicable permit requirements. The remaining portions of this WAP address physical and chemical characterization of the waste.

2.B Waste Characterization

Waste analysis parameters were selected based on process knowledge, historical analysis, and analysis suggested by EPA Region 5 guidance. These parameters include pH, TDS, TSS, specific gravity, and toxicity characteristics. The pH is generally near neutral to basic (i.e., averaging 7.8-7.9 for analysis performed in 2017-2019, and ranging from 5.9 to 9.7). The total dissolved solids (TDS) concentration of the waste is also a useful indicator of fluid properties. Calcium, sodium, and potassium have been among the predominant cations and chloride is the predominant anion, with bicarbonate/carbonate alkalinity also a major component. TDS average (2017-2019) ranges from approximately 19,300 to 64,171 mg/l. Because the native brine present in the Mt. Simon contains relatively high TDS including high cation-anion concentration, injectate will have a lower TDS concentration that natural formation waters.

Testing for pH, specific gravity, temperature, Eh, and specific conductance will be performed daily when waste is injected. Testing for total dissolved solids (TDS) and total organic carbon (TOC) will be performed monthly. Although only a limited number of chemical constituents are expected in injectate, a comprehensive analysis will be performed on a quarterly basis. The leachate is non-hazardous and originates from a sanitary, non-hazardous waste landfill, but a more comprehensive analysis will ensure the continued non-hazardous nature of injectate. Wastewater is not expected to be ignitable, reactive, or corrosive, but waste will be analyzed for flashpoint, reactive cyanide, and pH on a quarterly basis as a basic way to confirm the non-hazardous nature of the waste and to ensure any trends or changes are identified.

Table 2-1 of the following section lists the parameters and monitoring frequency used to characterize wastewater to be injected into the wells. While it is expected that fluid in each well will originate from tanks near the well(s), it is possible that fluid from any tank could service any well. Therefore, common and comprehensive waste analysis, applicable to both tanks, is proposed (i.e. not tank-specific). The

table also summarizes the applicable analytical method and reporting units for each. Characterization parameters were selected based on historical leachate sampling and identified for characterization needed to satisfy regulatory requirements and applicable specifications listed in typical Region 5 non-hazardous UIC permits.

2.C Sampling and Analysis

Samples will be collected on a daily, monthly, or quarterly basis via grab sample from the waste injection flow line downstream of filter from the final waste storage tank(s) during calendar days, months, or quarters when injection of waste takes place. The waste analysis to be conducted is designed to acquire representative samples of typical injectate. CFL personnel, contractor personnel, or contracted analytical laboratory personnel will collect required on-site waste stream samples. Sampling procedures will be conducted at the direction of site representatives and in accordance with the certified or accredited analytical laboratory procedures, and will meet the minimum current standard US EPA procedures. As applicable, the grab sample will be sent to an independent contract laboratory for analysis. Sufficient mixing and residence time in the system will have occurred at this sampling point for the waste to be representative of the waste stream that is being injected. The sampler's name, sampling point, and date sampled will be documented using COC methods specified in Section 3.A.

Table 2-1 presents the parameters, analytical methods, reporting unit and sample frequency for each test parameter. Sampling and analytical methods will meet or exceed the standards cited below or as presented in USEPA "Methods for the Chemical Analysis of Water and Wastes" or "Standard Methods for the Examination of Water and Wastewater".

TABLE 2-1
CARLETON FARMS LANDFILL
CLASS I WASTE SAMPLING AND ANALYSIS SUMMARY

Test Parameter	Example Test Methods*	Reporting Units	Frequency
Ignitability (flash point)	SW846 1010, SW1010A	---	Quarterly
Alkalinity (carbonate/bicarbonate), total	USEPA 310.1	mg/L	Quarterly
Reactive Sulfide and Cyanide	SW846 9010b, 376.1, USEPA 7.3.3.2/7.3.4.1/7.3.4.1	---	Quarterly
pH	USEPA 150.1	pH units	Daily when wells are in operation
Specific Gravity	Hydrometer, ASTM D1429, D5057		Daily when wells are in operation
Temperature	Thermometer	°F	Daily when wells are in operation
Specific Conductance	USEPA 120.1 or 9050A	*u*mhos	Daily when wells are in operation
Eh	ORP sensor	mV	Daily when wells are in operation
Wellhead TDS	USEPA 160.1	mg/L	Monthly
Wellhead TOC	USEPA 415.1	mg/L	Monthly
Toxicity Characteristic Constituents			
Arsenic (D004)	USEPA 6000 or 7000 series	mg/L	Quarterly
Barium (D005)	USEPA 6000 or 7000 series	mg/L	Quarterly
Benzene (D018)	USEPA 8260B/8021B	mg/L	Quarterly
Cadmium (D006)	USEPA 6000 or 7000 series	mg/L	Quarterly
Carbon Tetrachloride (D019)	USEPA 8260B/8021B	mg/L	Quarterly
Chlordane (D020)	USEPA 8081A, 8270	mg/L	Quarterly
Chlorobenzene (D021),	USEPA 8260B/8021B	mg/L	Quarterly
Chloroform (D022),	USEPA 8260B/8021B	mg/L	Quarterly

Test Parameter	Example Test Methods*	Reporting Units	Frequency
Chromium (D007)	USEPA 6000 or 7000 series	mg/L	Quarterly
o- Cresol (D023)	USEPA 8270C	mg/L	Quarterly
m-Cresol (D024)	USEPA 8270D	mg/L	Quarterly
p-Cresol (D025)	USEPA 8270D	mg/L	Quarterly
Cresol (D026)	USEPA 8270D	mg/L	Quarterly
2,4 D (D016)	USEPA 8151A	mg/L	Quarterly
1,4-Dichlorobenzene (D027)	USEPA 8260B/8021B	mg/L	Quarterly
1,2-Dichloroethane (D028)	USEPA 8260B/8021B	mg/L	Quarterly
1,1- Dichloroethylene (D029)	USEPA 8260B/8021B	mg/L	Quarterly
2,4-Dinitrotoluene (D030)	USEPA 8270C	mg/L	Quarterly
Endrin (D012)	USEPA 8081A, 8085, 8270	mg/L	Quarterly
Heptachlor (and its epoxide) D031	USEPA 8081A, 8085, 8270	mg/L	Quarterly
Hexachlorobenzene (D032)	USEPA 8081A, 8121, 8270C	mg/L	Quarterly
Hexachloro-1,3 butadiene (D033)	USEPA 8021B, 8260B	mg/L	Quarterly
Hexachloroethane (D034)	USEPA 8270CD	mg/L	Quarterly
Lead (D008)	USEPA 6000 or 7000 series	mg/L	Quarterly
Lindane (D013)	USEPA 8081A, 8270	mg/L	Quarterly
Mercury (D009)	USEPA 6000 or 7000 series	mg/L	Quarterly
Methoxychlor (D014)	USEPA 8270D, 8081A	mg/L	Quarterly
Methyl ethyl ketone (D035)	USEPA 8260B/8261	mg/L	Quarterly
Nitrobenzene (D036)	USEPA 8270D	mg/L	Quarterly
Pentachlorophenol (D037)	USEPA 8270D	mg/L	Quarterly
Pyridine (D038)	USEPA 8270D	mg/L	Quarterly
Selenium (D0101)	USEPA 6000 or 7000 series	mg/L	Quarterly
Silver (D011)	USEPA 6000 or 7000 series	mg/L	Quarterly
Tetrachloroethylene (D039)	USEPA 8260B/8021B	mg/L	Quarterly
Toxaphene (D015)	8081A, 8270	mg/L	Quarterly
Trichloroethylene (D040)	USEPA 8260B/8021B	mg/L	Quarterly
2,4,5-Trichlorophenol	USEPA 8270D	mg/L	Quarterly

Test Parameter	Example Test Methods*	Reporting Units	Frequency
2,4,6-Trichlorophenol	USEPA 8270D	mg/L	Quarterly
2,4,5-TP (Silvex) D017	8151A, 8321, 8085	mg/L	Quarterly
Vinyl Chloride (D043)	USEPA 8260B/8021B	mg/L	Quarterly
Additional Parameters			
Potassium	USEPA 200.7/6010	mg/L	Quarterly
Sodium	USEPA 200.7/6010B, 6020A, 3005A	mg/L	Quarterly
Chloride	USEPA 325.2/A4500, 300.0	mg/L	Quarterly
Total inorganic nitrogen	USEPA 350.2, 300.0	mg/L	Quarterly
Ammonia (as nitrogen)	USEPA 350.2,300.0	mg/L	Quarterly

Notes: * Test methods cited are examples; alternative methods with equal or better detection limits may be used

Results of select analyses collected to satisfy Landfill Operating License are presented in Section H of the EPA UIC Permit Application and are summarized in Section B.9 of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) 625 mineral well application. As shown in these Sections, analysis shows that only a relatively few organic and inorganic constituents are detected, and inorganic parameters are analyzed on an annual basis as required by the Landfill Operating License. In addition, the waste will be sampled and analyzed for other parameters required by this WAP as shown in Table 2-1, including but not limited to pH, specific gravity, temperature, TDS and TOC, along with chloride and other inorganic parameters that make up a major portion of the waste stream. Therefore, based on process knowledge and historical analytical results, the WAP parameter list provides analysis for 1) EPA mandated parameters; and 2) compounds typically present in injectate at significant concentrations (e.g. chloride).

It is important to note that CFL is required to perform ongoing leachate analysis as part of landfill operating permits and requirements. CFL may collect and analyze samples of injectate as described in this WAP, and share resulting data with operations to satisfy landfill operating permit requirements.